The invention in which an exclusive right is claimed is defined by the following:

1. A system for detecting a detecting hazardous particles associated with a parcel, comprising:

(a) a housing into which a parcel to be analyzed can be placed, so that a parcel can be isolated from an environment outside the housing;

(b) a triggering sampler in fluid communication with a volume of air within said housing, said triggering sampler capable of detecting particles associated with a parcel that are entrained within the volume of air in said housing, said triggering sampler generating a detection signal in response to the detection of such particles; and

(c) a detecting sampler in fluid communication with said volume of air and electrically coupled to respond to the detection signal from said triggering sampler, said detecting sampler, in response to said detection signal, removing particles entrained within said volume of air, thereby obtaining a sample of particles, to enable an analysis to determine if particles associated with a parcel that are collected by the detecting sampler are hazardous.

2. The system of Claim 1, wherein said system can accommodate parcels that include at least one of a postcard, an envelope, a flat, and a box.

3. The system of Claim 1, wherein particles associated with a parcel comprise at least one of particles adhered to an outer surface of a parcel, particles adhered to an inner surface of a parcel, particles entrained in a volume of air contained within a parcel, and particles contained within an inner volume of a parcel.

4. The system of Claim 1, wherein said triggering sampler is further adapted to respond to biological particles, distinguishing between biological and non-biological particles.

5. The system of Claim 1, wherein said housing is maintained at a negative pressure when the system is operational.

6. The system of Claim 1, wherein said housing comprises a high efficiency particulate air (HEPA) filter in fluid communication with said volume of air, said HEPA filter being adapted to filter air exhausted from said housing, to remove any particles from the air.

7. The system of Claim 1, further comprising a parcel feed system that conveys a plurality of parcels through said housing, said parcel feed system introducing a plurality of parcels into said housing so that each parcel is separated from other parcels.

8. The system of Claim 1, further comprising means for entraining particles associated with a parcel contained in said housing into said volume of air.

9. The system of Claim 8, wherein said means comprises a laser adapted to form at least one opening in a parcel.

10. The system of Claim 8, wherein said means comprise a mechanical perforator adapted to form at least one opening in a parcel.

11. The system of Claim 8, wherein said means comprises a splitting blade adapted to slice open a parcel.

12. The system of Claim 8, wherein said means comprises a device adapted to apply pressure to a parcel, thereby causing particles associated with a parcel to be dispersed into said volume of air contained within said housing.

13. The system of Claim 8, wherein said means comprises a blower disposed within said housing, said blower directing a jet of fluid toward a parcel, said jet of fluid enhancing an aerosolization of particles associated with a parcel.

14. The system of Claim 1, wherein said triggering sampler comprises a particle counter.

15. The system of Claim 14, wherein said particle counter comprises means for distinguishing between biological particles and non-biological particles.

16. The system of Claim 15, wherein the detection signal is generated only in response to a substantial increase in a number of biological particles being detected by the triggering sampler.

17. The system of Claim 15, wherein said particle counter comprises:

(a) a laser producing light in a waveband selected to produce auto-fluorescence in nicotinamide adenine dinucleotide (NAD); and

(b) at least one photon sensor that detects auto-fluorescence light emitted from laser excited NAD, producing a particle count signal in response thereto.

18. The system of Claim 17, further comprising a processor electrically coupled to said at least one photon sensor, said processor producing a detection signal in response to a biological particle count based on said particle count signal.

19. The system of Claim 18, wherein said processor prevents said detection signal from being generated until a predefined number of biological particles are detected.

20. The system of Claim 17, wherein said laser comprises a diode laser that emits light having a wavelength of between about 355 nanometers and about 370 nanometers.

21. The system of Claim 1, wherein said triggering sampler comprises a virtual impactor in fluid communication with said volume of air, said virtual impactor separating a fluid stream into a major flow and a minor flow, the major flow including a minor portion of particles that are above a predetermined size and the minor flow including a major portion of the particles that are above the predetermined size, said virtual impactor including a minor flow outlet through which the minor flow exits the virtual impactor, said detection signal being produced in response to particles detected in the minor flow.

22. The system of Claim 1, wherein said triggering sampler comprises:

(a) a radial arm collector in fluid communication with said volume of air, said radial arm collector collecting any particles that were entrained in said volume of air and retaining said particles upon a surface of said radial arm collector;

(b) a rinse fluid supply;

(c) a rinse fluid line in fluid communication with said rinse fluid supply, said rinse fluid line conveying a rinse fluid onto the surface so that any particles adhering to said surface are carried away with the rinse fluid;

(d) a collection volume disposed adjacent to said surface, such that particles rinsed from said surface are carried by the rinse fluid into the collection volume; and

(e) a particle counter disposed adjacent to said collection volume, and said particle counter counting particles carried into said collection volume.

23. The system of Claim 22, wherein said triggering sampler further comprises a virtual impactor in fluid communication with said volume of air, said virtual impactor separating a fluid stream into a major flow and a minor flow, the major flow including a minor portion of particles that are above a predetermined size and the minor flow including a major portion of the particles that are above the predetermined size, said virtual impactor including a minor flow outlet through which the minor flow exits the virtual impactor, said minor flow outlet being in fluid communication with said radial arm collector.

24. The system of Claim 22, wherein said rinse fluid supply comprises a rinse fluid that includes an enzyme that degrades cellulose.

25. The system of Claim 1, wherein said triggering sampler comprises a prefilter that removes particles above a predetermined size from said volume of air.

26. The system of Claim 1, further comprising a prefilter that removes particles above a predetermined size from said volume of air.

27. The system of Claim 1, wherein said detecting sampler comprises a prefilter that removes particles above a predetermined size from said volume of air.

28. The system of Claim 1, wherein said detecting sampler comprises:

(a) a radial arm collector in fluid communication with said volume of air, said radial arm collector collecting particles entrained in said volume of air and retaining said particles upon a surface of said radial arm collector;

(b) a rinse fluid supply,

(c) a rinse fluid line in fluid communication with said rinse fluid supply, said rinse fluid line conveying a rinse fluid onto the surface so that any particles adhering to said surface are carried away with the rinse fluid; and

(d) a collection volume disposed adjacent to said surface, such that particles rinsed from said surface are carried by the rinse fluid into the collection volume for analysis to determine if the particles comprise a harmful substance.

29. The system of Claim 28, wherein said rinse fluid supply comprises a rinse fluid that includes an enzyme that degrades cellulose.

30. The system of Claim 28, wherein said detecting sampler further comprises a virtual impactor in fluid communication with said volume of air, said virtual impactor separating a fluid stream into a major flow and a minor flow, the major flow including a minor portion of particles that are above a predetermined size and the minor flow including a major portion of the particles that are above the predetermined size, said virtual impactor including a minor flow outlet through which the minor flow exits the virtual impactor, said minor flow outlet being in fluid communication with said radial arm collector.

31. The system of Claim 1, wherein said detecting sampler comprises:

(a) a disposable radial arm collector in fluid communication with said volume of air, said radial arm collector collecting any particles that were entrained in said volume of air and retaining such particles upon a surface of said disposable radial arm collector; and

(b) a prime mover drivingly coupled to rotate a collector arm of said disposable radial arm collector, so that the collector arm impacts particles entrained in the fluid as the collector arm is rotated, said particles being retained on the surface of the collector arm.

32. The system of Claim 31, wherein said disposable radial arm collector is magnetically coupled to said prime mover.

33. The system of Claim 1, further comprising an archiving sampler in fluid communication with said volume of air, said archiving sampler obtaining an archival sample of particles entrained within said volume of air.

34. The system of Claim 33, wherein said archiving sampler comprises:

(a) a virtual impactor in fluid communication with said volume of air, said virtual impactor separating a fluid stream into a major flow and a minor flow, the major flow including a minor portion of particles that are above a predetermined size and the minor flow including a major portion of the particles that are above the predetermined size, said virtual impactor including a minor flow outlet through which the minor flow exits the virtual impactor;

(b) an archival surface disposed adjacent to said virtual impactor, such that the minor flow of fluid exiting said minor flow outlet is directed toward said archival surface; and

(c) a prime mover drivingly coupled to one of said virtual impactor and said archival surface, causing a relative position of said virtual impactor and said archival surface to be selectively changed over time, so that the minor flow of fluid exiting through said minor flow outlet is directed toward a different portion of said archival surface over time.

35. The system of Claim 1, further comprising a virtual impactor in fluid communication with said volume of air, a virtual impactor in fluid communication with said volume of air, said virtual impactor separating a fluid stream into a major flow and a minor flow, the major flow including a minor portion of particles that are above a predetermined size and the minor flow including a major portion of the particles that are above the predetermined size, said virtual impactor including a minor flow outlet through which the minor flow exits the virtual impactor, said minor flow outlet being in fluid communication with at least one of said triggering sampler and said detecting sampler.

36. The system of Claim 35, wherein the virtual impactor comprises a separation plate for separating particles from a fluid stream produced with fluid drawn from the volume of air, said separation plate having a first surface and an opposing second surface, the first surface including plural pairs of a nozzle and a virtual impactor, the nozzle having an inlet end and an outlet end and tapering from the inlet end to the outlet end, the virtual impactor further comprising a pair of fin-shaped projections, each fin-shaped projection having a convex outer wall and an inner wall, the inner walls of the pair of fin-shaped projections facing each other and being spaced apart to define an upstream minor flow passage therebetween, the convex outer walls of the pair of fin-shaped projections cooperatively presenting a convex surface defining a virtual impact void therethrough, the virtual impact void defining an inlet end of the upstream minor flow passage, the convex surface facing the outlet end of each nozzle such that the nozzle and the upstream minor flow passage are generally aligned with each other.

37. The system of Claim 35, wherein the virtual impactor comprises a separation plate for separating particles from a fluid stream produced with fluid from the volume of air, said separation plate having a first surface and an opposing second surface, the first surface including plural pairs of a nozzle and a virtual impactor, the nozzle having an inlet end and an outlet end and tapering from the inlet end to the outlet end, the virtual impactor is generally haystack-shaped having a convex surface facing the outlet end of each nozzle, the convex surface defining a virtual impact void therethrough, the virtual impact void defining a terminal end of a minor flow passage that communicates between the first and second surfaces.

38. The system of Claim 35, wherein the virtual impactor comprises a separation plate employed for separating a fluid stream produced with fluid from the volume of air into a major flow and a minor flow, the major flow including a minor portion of particles that are above a predetermined size and the minor flow including a major portion of the particles that are above the predetermined size, said separation plate comprising:

(a) a block in which is defined a laterally extending passage having an inlet disposed on one edge of the block and an outlet disposed on an opposite edge of the block, said passage having a length extending between said inlet and said outlet, a lateral dimension extending along opposed surfaces of the passage in a direction that is orthogonal to the length and to a transverse dimension extending between the opposed surfaces, said lateral dimension being substantially greater than the transverse dimension of the passage, the opposed surfaces of said passage between which the transverse dimension of the passage is defined generally converging toward each other within the block so that said outlet has a substantially smaller cross-sectional area than said inlet;

(b) a transverse, laterally extending slot defined within said block, in fluid communication with a portion of the passage that has the substantially smaller cross-sectional area; and

(c) a major flow outlet port defined in the block, in fluid communication with the transverse, laterally extending slot, the major flow entering the slot and exiting the block through the major flow outlet port, while the minor flow exits the block through the outlet of the passage, said major flow carrying the minor portion of the particles and said minor flow carrying the major portion of the particles that are above the predetermined size.

39. The system of Claim 35, wherein the virtual impactor comprises:

(a) a block having a front and a rear;

(b) a laterally extending passage defined within the block and extending between an inlet at the front and an outlet at the rear of the block, said passage converging to a receiving nozzle between the inlet and the outlet, the inlet having a substantially greater height than the outlet, but the height of the inlet to the passage being substantially less than a width of the passage;

(c) an elongate slot extending transverse to the passage and disposed distally of the receiving nozzle; and

(d) a major flow orifice formed within the block and intersecting the slot, said major flow orifice providing a fluid path for the major flow to exit the block after changing direction, the minor flow continuing on and out of the outlet of the passage, so that the major portion of the particles above the predetermined size are carried with the minor flow through the outlet of the passage, while the minor portion of the particles above the predetermined size are carried with the major flow through the major flow orifice.

40. The system of Claim 1, further comprising a radial arm collector in fluid communication with said volume of air, said radial arm collector capturing particles entrained in a volume of fluid upon a surface of the radial arm collector, to enable at least one of the triggering sampler and the detecting sampler to obtain a sample of particles entrained in said volume of air.

41. The system of Claim 40, wherein the radial arm collector comprises:

(a) a prime mover having a drive shaft that is drivingly rotated;

(b) an impeller that is mechanically coupled to the drive shaft and rotated thereby; and

(c) a housing for the impeller, said housing defining a fluid passage for conveying the fluid in which the particles are entrained to the impeller, said impeller including vanes that draw the fluid into the housing so that the particles entrained in the fluid impact upon the impeller, being thereby separated from the fluid when impacted by the vanes of the impeller.

42. The system of Claim 40, wherein the radial arm collector comprises:

(a) a housing defining a port through which passes the fluid in which the particles are entrained;

(b) an electrically energizable motor that rotates a drive shaft; and

(c) a combined impact collector and fan mechanically coupled to the drive shaft and rotated thereby, said combined impact collector and fan being disposed within a cavity defined by the housing, rotation of the combined impact collector and fan drawing the fluid into the cavity of the housing through the port, the particles in the fluid impacting the combined impact collector and fan and being retained thereon and being thus separated from the fluid.

43. The system of Claim 1, further comprising an alarm electrically coupled to said triggering sampler, said alarm being activated in response to receiving said detection signal from said triggering sampler.

44. The system of Claim 1, wherein the detecting sampler includes an identification unit to analyze a sample of particles obtained from said volume of air by said detecting sampler to determine if a target substance is present in said sample of particles.

45. The system of Claim 44, wherein said identification unit comprises a polymerase chain reaction analyzer.

46. The system of Claim 44, wherein said target substance comprises one of a biological agent and a chemical agent.

47. The system of Claim 44, wherein said identification unit produces a target detection signal in response to detection of the target substance, further comprising an alarm electrically coupled to the identification unit, said alarm being activated in response to said target detection signal.

48. The system of Claim 44, further comprising a control unit electrically coupled to said triggering sampler and said detecting sampler, said control unit producing a target detection signal in response to the detection of the target substance by said identification unit.

49. The system of Claim 47, further comprising a decontamination system in fluid communication with said volume of air, said decontamination system being electrically coupled to said identification unit and operative to introduce a decontamination agent into said volume of air in response to receiving said target detection signal from said identification unit.

50. The system of Claim 49, wherein said decontamination agent comprises a disinfectant solution selected to destroy a biological contaminant that has been carried into the housing by a parcel.

51. The system of Claim 1, further comprising a decontamination system in fluid communication with said volume of air and electrically coupled to said triggering sampler, said decontamination system being operative to introduce a decontamination agent into said volume of air in response to receiving said detection signal from said triggering sampler.

52. The system of Claim 51, wherein said decontamination agent comprises a disinfectant solution selected to destroy biological contaminant that has been carried into the housing by a parcel.

53. A system for detecting harmful contaminants during mail processing, wherein said contaminates are associated with an item of mail, comprising:

(a) a housing through which mail is conveyed to detect an item of mail that is contaminated, so that a harmful substance contaminating an item of mail is isolated from the environment outside the housing;

(b) a triggering sampler in fluid communication with a volume of air within said housing, said triggering sampler being adapted to obtain particles from an item of mail, said particles being entrained within the volume of air in said housing, said triggering sampler generating a detection signal in response to the particles;

(c) a detecting sampler in fluid communication with said volume of air and responsive to the detection signal, said detecting sampler being adapted to obtain a sample of particles within said volume of air in response to receiving said detection signal, to enable an analysis to detect particles of a contaminant that is harmful; and

(d) a control unit electrically coupled to the triggering sampler and to the detecting sampler to control the operation of said system, said control unit conveying said detection signal to said detecting sampler.

54. A system for detecting a harmful contaminant that is associated with a parcel, comprising:

(a) a housing into which a parcel to be analyzed is placed, so that so any contaminant carried by the parcel is isolated from an environment outside the housing;

(b) means for distributing particles associated with a parcel into a volume of air within said housing;

(c) a triggering sampler in fluid communication with said volume of air within said housing and operative to detect trace amounts of particles within said volume of air, said triggering sampler generating a detection signal in response detection of such particles; and

(d) a detecting sampler in fluid communication with said volume of air and electrically coupled to respond to the detection signal, said detecting sampler obtaining a sample of particles within said volume of air in response to said detection signal, to enable an analysis of such particles to determine if a harmful contaminant is present.

55. A method for detecting the presence of a chemical or a biological agent in association with a parcel, comprising the steps of:

(a) obtaining a first sample of particles associated with said parcel;

(b) determining at least one of a quantitative and a qualitative measure of the first sample of particles;

(c) in response to said at least one of the qualitative and the quantitative measure, obtaining a second sample of particles associated with said parcel; and

(d) analyzing the second sample of particles, to determine if at least one of a chemical agent and a biological agent is associated with said parcel.

56. The method of Claim 55, further comprising the step of isolating said parcel from an ambient environment before obtaining said first sample of particles.

57. The method of Claim 55, wherein the step of isolating said parcel from the ambient environment comprises the step of introducing the parcel into a containment chamber kept under a negative pressure relative to an atmospheric pressure of the ambient environment.

58. The method of Claim 57, wherein the step of introducing the parcel into a containment chamber kept under negative pressure comprises the step of utilizing conventional mail processing equipment to convey a plurality of parcels into the containment chamber so that each parcel is individually accessible in the containment chamber.

59. The method of Claim 57, wherein the step of introducing the parcel comprises the step of conveying a plurality of parcels on a conveyor into the containment chamber.

60. The method of Claim 55, wherein the step of obtaining the first sample of particles comprises the step of forming at least one opening in the parcel using a laser to enable particles contained within the parcel to be sampled.

61. The method of Claim 55, wherein the step of obtaining the first sample of particles comprises the step of forming at least one opening in the parcel using a mechanical perforator to enable particles from within the parcel to be sampled.

62. The method of Claim 55, wherein the step of obtaining the first sample of particles comprises the step of using an envelope splitter to open the parcel to enable particles from within the parcel to be sampled.

63. The method of Claim 55, wherein the step of obtaining the first sample of particles comprises the step of compressing the parcel to expel particles from within the parcel, to enable such particles to be sampled.

64. The method of Claim 55, wherein the step of obtaining a first sample of particles further comprises the step of using a blower to direct a jet of air toward the parcel, thereby enhancing an aerosolization of any particles associated with the parcel.

65. The method of Claim 55, wherein the step of determining at least one of a quantitative and a qualitative measure of the first sample of particles associated with the parcel comprises the step of counting a number of particles present in the first sample.

66. The method of Claim 65, wherein the step of determining at least one of a quantitative and a qualitative measure of the first sample of particles comprises the steps of separating the first sample into a major flow and a minor flow, such that the majority of particles are entrained in the minor flow, and counting the particles in the minor flow.

67. The method of Claim 65, wherein the step of determining at least one of a quantitative and a qualitative measure of the first sample of particles comprises the steps of:

(a) using a rotating arm collector to collect particles entrained in the first sample of particles;

(b) rinsing the collected particles from the rotating arm collector with a rinse fluid; and

(c) counting the particles in the rinse fluid.

68. The method of Claim 67, wherein the step of rinsing the collected particles from the rotating arm collector with a rinse fluid comprises the steps of using a rinse fluid that includes an enzyme that causes cellulose to degrade, thereby reducing a build up of paper fibers on said rotating arm collector.

69. The method of Claim 65, wherein the step of counting the number of particles in the first sample comprises at least one of the steps of:

(a) determining a total number of particles in the first sample; and

(b) determining a total number of biological particles in the first sample.

70. The method of Claim 69, further comprising the step of determining whether the parcel is potentially contaminated with a harmful agent by determining if the total number of particles in the first sample exceeds a predetermined threshold value.

71. The method of Claim 69, further comprising the step of determining whether the parcel is potentially contaminated by determining if the total number of biological particles in the first sample exceeds a predetermined threshold value.

72. The method of Claim 69, further comprising the step of determining whether the parcel is potentially contaminated by determining if any biological particles are present in the first sample.

73. The method of Claim 55, further comprising the step of determining whether the parcel is potentially contaminated by determining if at least one of the following conditions exist:

(a) the total number of particles in the first sample exceeds a predetermined threshold value;

(b) the total number of biological particles in the first sample exceeds a predetermined threshold value; and

(c) any biological particles are present in the first sample.

74. The method of Claim 55, wherein the step of obtaining a second sample of particles associated with the parcel comprises the step obtaining a sample from a location proximate to where the first sample was obtained.

75. The method of Claim 55, wherein the step of obtaining a second sample of particles associated with the parcel comprises the steps of separating the second sample into a major flow and a minor flow, such that the majority of particles are entrained in the minor flow; and, directing the minor flow toward a particle collector.

76. The method of Claim 55, wherein the step of obtaining a second sample of particles associated with the parcel comprises the step of using a rotating arm collector to collect particles entrained in the second sample.

77. The method of Claim 76, wherein the step of obtaining a second sample of particles associated with the parcel further comprises the steps of:

(a) rinsing the collected particles from the rotating arm collector with a rinse fluid, and

(b) collecting the rinse fluid containing the particles rinsed from the rotating arm collector to obtain the second sample.

78. The method of Claim 55, wherein the step of analyzing the second sample comprises the steps of analyzing any particulates obtained from the second sample to detect a specific one of a chemical agent and a biological agent.

79. The method of Claim 55, further comprising the step of decontaminating the parcel after obtaining the second sample if it is determined that the parcel is contaminated with one of a biological and a chemical agent.

80. The method of Claim 55, further comprising the step of activating an alarm if it is determined that the parcel is contaminated with one of a biological and a chemical agent.

81. The method of Claim 55, further comprising the step of decontaminating the parcel after obtaining the second sample if it is determined that the parcel is contaminated with one of a biological and a chemical agent.

82. The method of Claim 55, further comprising the step of decontaminating the parcel and the area proximate to the parcel after obtaining the second sample if it is determined that the parcel is contaminated with one of a biological and a chemical agent.

83. The method of Claim 55, further comprising the step of temporarily stopping processing of additional parcels to detect contamination in such additional parcels if it is determined that the parcel is contaminated with one of a biological and a chemical agent.

84. The method of Claim 55, further comprising the step of obtaining an archival sample if it is determined that the parcel is potentially contaminated with one of a biological and a chemical agent.

85. The method of Claim 84, wherein the step of obtaining the archival sample comprises the step of directing particles associated with the parcel toward a specific location on an archival surface, to deposit a spot of particles on the archival surface, such that each spot of particles deposited on the archival surface represents an archival sampled from a different parcel.

86. The method of Claim 84, wherein the step of obtaining the archival sample comprises the steps of separating a flow of fluid containing particles associated with the parcel into a major flow and a minor flow, such that the majority of particles from the flow of fluid are entrained in the minor flow, and directing the minor flow toward an archival surface, to deposit a spot of particles on the archival surface, such that each spot of particles deposited on the archival surface represents an archival sampled from a different parcel.

87. The method of Claim 55, further comprising the step of obtaining an archival sample if it is determined that the parcel is contaminated with one of biological and a chemical agent.